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## VERIFIED TRANSLATION

I, the undersigned Patricia HARDING, BA(Hons),  
technical translator to RWS Group plc, of Europa House, Marsham Way, Gerrards Cross,  
Buckinghamshire, England, do hereby declare:

- (1) That I am well familiar with the Swedish and English languages;
- (2) That the attached is a true and accurate translation into the English language of the Swedish text of this Patent Application entitled "Input Unit Arrangement" that was filed in the US Patent and Trademark Office on 31 May 2000.

(3) That all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under § 1001 of title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated this 21st day of August 2000

  
P. HARDING

For and on behalf of RWS Group plc

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UNITED STATES PATENT APPLICATION

OF

PETTER ERICSON  
AND  
CHRISTER FÄHRÆUS

FOR

INPUT UNIT ARRANGEMENT

### Technical field

This invention concerns an input unit arrangement with a mouse function and an input function, comprising image-recording means for recording images and signal-processing means for processing the images to achieve the mouse function and the input function. The invention also concerns an input unit arrangement with a mouse function, a mouse pad and use of an absolute position-coding pattern.

### Background of the Invention

A mouse is used to position a cursor on a computer screen and to give various commands to the computer.

Currently, the most common mouse is an electronic type. However, an optical mouse is also available.

JP 09190277 discloses an optical mouse which has a CCD line sensor for the X-axis and a CCD line sensor for the Y-axis. Data which is recorded by the CCD line sensors at a particular time is compared with data which is recorded at a subsequent time, by means of which the movement of the mouse in the X- and Y-direction can be determined.

US Patent US 4,814,553 discloses a similar optical mouse which can determine its absolute position on a mouse pad which is provided with a specific line pattern.

The combination of a mouse function and an input function in an input unit is also known. An example of this is shown in the Applicant's Swedish Patent Appli-

cation No. 9803455-6. This describes an input unit which comprises image-recording means for recording images and image-processing means for processing the images to achieve the input function and the mouse function. The mouse function is more specifically based on the determination of the relative positions of images recorded in succession.

It is a general requirement that a mouse or other input unit is to be able to carry out as many functions as possible and be used by the user in as flexible and simple a way as possible.

#### Summary of the Invention

An object of the invention is therefore to make it possible for the user to change between different functions of an input unit quickly and easily.

This object is achieved by an input unit arrangement according to claims 1 and 6, a mouse pad according to claim 12 and use according to claim 18.

An input unit arrangement according to the invention thus comprises image-recording means for recording images and signal-processing means for processing the images to achieve the mouse function and the input function, the input unit arrangement being arranged to change from the input function to the mouse function when the signal-processing means detect a predetermined position-coding pattern in one of said images.

Thus, instead of the user changing the function manually, the input unit arrangement automatically changes from the input function to the mouse function when the predetermined position-coding pattern is detected.

The position-coding pattern is advantageously located on a mouse pad which is used together with the input unit arrangement. When the user places the input unit on the mouse pad, the image-recording means record an image of the position-coding pattern on the mouse pad. When the signal-processing means detect that the position-coding pattern is the predetermined one, the recorded images are processed in such a way that the mouse function is achieved.

In this connection it should be pointed out that by input function is meant here a function whereby the user can input information into a receiver for storage and processing within this, as distinct from the mouse function which is used for positioning purposes.

The whole input unit arrangement can be contained in one casing, that is in one physical unit. It can also be divided between two physical casings, for example a user unit which the user operates and a computer with which the user unit communicates, in which case part of the signal processing can be carried out in the computer. The signal-processing means can thus be fully integrated with

the image-recording means, can be partially integrated with these or are not integrated with these at all.

Of course, the input unit arrangement can also be suitably arranged to change from the mouse function to the input function when it detects another pattern than the predetermined position-coding pattern in one of said images, so that an automatic change is also achieved for the input function. The other pattern can be an arbitrary pattern, that is the input unit arrangement detects that an image does not contain the predetermined position-coding pattern. It can also be another predetermined pattern, but does not need to be a position-coding pattern.

The first position-coding pattern is advantageously a first absolute position-coding pattern which codes a plurality of positions, the input unit arrangement being arranged to carry out the change from the input function to the mouse function when the signal-processing means detect one of said plurality of positions on the basis of the predetermined pattern.

An absolute position-coding pattern is advantageous as the identification of this requires little processor capacity in the input unit arrangement. The pattern can be detected in the form of the positions or coordinates which it codes. No matching of any previously stored pattern needs to be carried out. In addition, if the mouse function is based on position determination using an absolute position-coding pattern on a mouse pad, the

input unit arrangement only needs to be supplemented by a simple program routine which checks whether the positions lie within the area which is coded by the position-coding pattern on the mouse pad and activates the mouse function if this is the case.

The first absolute position-coding pattern is advantageously part of a larger virtual absolute position-coding pattern which comprises a second absolute position-coding pattern, the arrangement being arranged to change from the mouse function to the input function when it detects a position which is coded by the second absolute position-coding pattern. The second absolute position-coding pattern can, for example, be dedicated to the recording of handwritten text, so that when the signal-processing means detect coordinates which are coded by this part of the pattern, the coordinates are processed as representing handwriting.

US 5,852,434 describes an example of an absolute position-coding pattern. The Applicant's Swedish Patent Applications SE 9901954-9 and SE 9903541-2, which were not publicly available at the time of filing the present application, describe other examples of absolute position-coding patterns. These patterns are used to digitize handwritten text which is written on a writing surface provided with this pattern. They can thus be used for an input function of an input unit for a computer. They can, however, also be used to achieve a mouse function of an

input unit. If the pattern codes a sufficiently large number of positions, a first part of the pattern, that is a particular position or coordinate area, can be dedicated to the mouse function and a second part of the pattern to the input function. The input unit can then automatically change from the input function to the mouse function when it detects a position situated within the part of the pattern dedicated to the input function, and from the mouse function to the input function when it detects a position situated within the part dedicated to the input function.

In addition, the first absolute position-coding pattern is advantageously divided into at least two domains, the input unit being arranged to achieve different functions depending upon which of said at least two domains is detected by the image-processing means.

The idea of dividing the absolute position-coding pattern into different parts can thus be utilized in a form of tree structure so that the area which is dedicated to the mouse function is divided into sub-areas, so-called domains, to which are associated different functions of the input unit arrangement. In this way a user can cause the input unit arrangement to carry out different functions in a very simple way, depending upon where he places the input unit on a mouse pad.



The idea described above can of course be utilized for an input unit arrangement which has only a mouse function.

According to a second aspect of the invention, this concerns therefore an input unit arrangement with a mouse function which comprises image-recording means for recording images and signal-processing means for processing images to achieve the mouse function, the signal-processing means being arranged to detect an absolute position-coding pattern in one of said images, to determine a position based on the absolute position-coding pattern and to detect to which of at least two domains the position belongs, the input unit arrangement being arranged to carry out different functions depending upon which domain the signal-processing means detect.

The input unit arrangement thus contains information about at least two different domains of the absolute position-coding pattern and has different functions associated with these domains.

The input unit arrangement is advantageously arranged to generate a command for control of an external computer when it detects a predetermined one of said at least two domains. Instead of the user clicking with a mouse button, he can thus read the absolute position-coding pattern in a domain. He can then use the input unit arrangement in essentially the same way both for positioning a cursor and for giving a command to the

computer with which the input unit arrangement communicates.

The command can advantageously concern the opening of a program in the computer. The user can then for example cause the computer to open a program for electronic mail simply by placing the input unit arrangement on a domain which is dedicated to this.

In addition, the input unit arrangement is advantageously arranged to work in a relative mode when the signal-processing means detect a domain dedicated to relative mode and in absolute mode when the signal-processing means detect a domain dedicated to absolute mode.

The use of both a relative mode and an absolute mode increases the flexibility for the user.

The arrangement is advantageously arranged to work in a scrolling mode when the signal-processing means detect a domain dedicated to scrolling mode.

This thus replaces the scrolling roller which is to be found on some mechanical mice.

The input function advantageously comprises a scanner function so that the input unit can be used to input text and/or images.

According to a third aspect of the invention, this concerns a mouse pad which is provided with a position-coding pattern which is divided into at least two domains which are intended to achieve different functions of a mouse.

The advantages of this mouse pad are apparent from the above discussion of the input unit arrangement.

According to a fourth aspect of the invention, this concerns use of an absolute position-coding pattern to cause an input unit arrangement which has a mouse function to change from a first to a second function.

The advantages of this use are apparent from the above.

#### Brief Description of the Drawing

Embodiments of the invention will be described below in greater detail with reference to the accompanying drawing in which the figure shows diagrammatically an embodiment of an input unit arrangement according to the invention, an embodiment of a mouse pad according to the invention and a computer with which the input unit arrangement communicates.

#### Description of a Preferred Embodiment

The figure shows a mouse pad 100, a computer 200 and an input unit 300 for the computer. Together with programs in the computer 200, the input unit 300 forms an input unit arrangement according to the invention.

The mouse pad 100 is divided into a plurality of different areas. It has a first working field 110 for relative mouse function, a second working field 111 for absolute mouse function, a scrolling field 112, a scanner field 113 for changing to scanner function and a command

field 120 in which a number of predetermined commands are indicated.

An absolute position-coding pattern 150 extends over the whole mouse pad. For the sake of clarity, the pattern is shown greatly enlarged on only a small part of the mouse pad.

The absolute position-coding pattern can be any type which systematically codes coordinates for a large number of positions on the mouse pad, so that the position of the input unit can be determined regardless of where the input unit is placed on the mouse pad.

The pattern can, for example, be of the type shown in US 5,852,434, where each position is coded by one specific symbol. However, it can advantageously be of the type shown in the Applicant's Swedish Patent Applications SE 9901954-9 and SE 9903541-2, where each position is coded by a plurality of symbols and each symbol contributes to the coding of several positions. These applications, which were not publicly available at the time of the filing of the present application, are incorporated herewith by reference.

In these latter applications the pattern is constructed of a small number of types of symbol. For example, it can be constructed of two different-sized dots which represent a one and a zero respectively or of a dot which can have four different positions in relation

to a raster point and in this way can code four different values.

The figure shows the position-coding pattern on the mouse pad constructed of dots 5 of two different sizes. These represent a one and a zero respectively. A number of such symbols, for example 5 x 5 symbols, combine to code the coordinates of a point on the mouse pad.

Different parts of the position-coding pattern, that is different co-ordinate areas or domains, can be associated with different functions, as will be described in greater detail below. For example, the coordinates which code positions within the scrolling field 112 can be associated with a scrolling function so that when the input unit arrangement detects coordinates which lie within the scrolling field it generates a scrolling command to the computer 200. As a result, the user can achieve scrolling simply by placing the input unit 300 in the scrolling field.

In this embodiment the input unit 300 has a mouse function and an input function, more specifically a scanner or reading pen function.

The input unit 300 has a casing 1 in the shape of a pen. One short side of the casing has a window 2 through which images are recorded for the different functions of the input unit.

The casing 1 contains principally an optics part, an electronic part and a power supply.

The optics component comprises a plurality of light-emitting diodes 6, a lens system 7 and an optical sensor 8 which constitutes the interface with the electronic part.

The light-emitting diodes 6 are intended to illuminate a surface which is then below the window.

The lens system 7 is intended to project an image of the surface which is below the window 2 onto the light-sensitive sensor 8 in as correct a way as possible. The optical sensor 8 can consist of a two-dimensional quadratic CCD unit (CCD = charge-coupled device) with built-in A/D converter. Such sensors are commercially available.

The power supply for the input unit is obtained from a battery 12.

The electronic part comprises a processor 20 with conventional associated circuits, such as various types of memory, and associated programs for carrying out the functions described here. The processor 20 forms part of the input unit arrangement's signal-processing means. The electronic part also comprises a transceiver 26 for transmitting information to/from the computer 200. The transceiver can be based on infrared technology or radio technology for transmission over short distances, for example in accordance with the Bluetooth standard. The electronic part further comprises buttons 27, by means of which the user can control the input unit, for example switch it on and off.

The computer 200 is an ordinary personal computer with circuits and programs which make possible communication with the input unit 300. However, in this embodiment this also contains software which constitutes part of the input unit arrangement's signal-processing means. The software stores information about which functions are associated with different domains of the position-coding pattern. The software is shown symbolically by broken lines and reference numeral 210.

As mentioned, the input unit 300 has a scanner function and a mouse function.

The scanner function is used to record text. The scanner function can be of the type described in the Applicant's Swedish Patent No. 9604008-4, where text is recorded by recording a plurality of images with partially overlapping content and putting them together, after which the characters in the put-together image are localized, identified and stored in character-coded format.

The mouse function is used to control a cursor on the display 201 of a computer 200. The mouse function is achieved as follows. When the user moves the input unit 300 on the mouse pad 200, the image-recording means record images at a predetermined frequency. Each image reproduces part of the position-coding pattern on the mouse pad, which part is sufficiently large for the processor 20 to be able to determine the position of the input unit on the mouse pad. More specifically, the pro-

cessor 20 localizes the symbols of which the position-coding pattern is constructed in each image, translates the symbols into coordinates according to predetermined algorithms and sends the coordinates to the computer 200 via the transceiver 26. The software 210 interprets the coordinates and converts these into positioning signals for a cursor on the display 201 of the computer.

The arrangement described above is used in the following way. First assume that the user wants to use the input unit as an ordinary relative mouse. He places the input unit 300 in the first working field 110. The processor 20 detects the coordinates in the image recorded by the sensor 8 and sends the coordinates to the computer 200, in which the software 210 detects that the coordinates belong to the working field 110 and that they are therefore to be interpreted as relative mouse functions. As long as the software 210 receives coordinates which belong to the working field 110 it will generate commands to the computer 200 for moving the cursor on the screen 201 in a corresponding way to the way the user has moved the input unit over the working field 110. The working field 111 for absolute mouse function can be used in a corresponding way, with the difference that the software 210 maps positions in the working field 111 to positions of the cursor on the computer screen 201.

Assume next that the user edits a document in the computer 200. He can mark text in the same way as with



a traditional mouse by "clicking" with the buttons 27. Assume that the user first wants to replace a first piece of text with a second piece of text which is situated elsewhere in the text. The user marks the second piece of text using the input unit. Then he places the input unit in the command field which is labeled with the command "cut" on the mouse pad 100. The input unit then sends the coordinates read from this field to the software 210 in the computer 200 which identifies that the coordinates represent the command "cut" and creates the corresponding command for the word-processing application concerned, which cuts out the marked piece of text. The user next marks the first piece of text using the input unit and then causes the computer to paste the cut-out piece of text in place of the marked text by reading the coordinates for the command "paste" using the input unit.

Now assume that the user next wants to enter text from a newspaper in his document. He first positions the cursor in the required position using the mouse function of the input unit. Then he changes the input unit arrangement to the scanner function by placing the input unit on the scanner field 113 and scans in the text from the newspaper. The text is converted to character-coded format and transmitted to the software which generates commands for inserting the text in the position marked by the cursor.

Now assume that the user sees an interesting web address in the newspaper he is reading and wants to look at this web page. He places the input unit 300 on the command field 120 with the text "www" Reading coordinates in this field results in the software 210 creating a command which opens a web browser program in the computer 200. Then the user can change the input unit arrangement to the scanner function in the way described above and read the web address from the newspaper. The recorded text is transferred to the computer 200 which can open the page corresponding to the recorded address.

Finally, assume that the user wants to send an e-mail to a friend. He places the input unit on the e-mail field of the mouse pad. Reading a pair of coordinates in this field results in the software 210 generating a command to the computer which causes it to open the e-mail program. The user can then record the required e-mail address and even the content of the message using the scanner function.

In addition, the user can himself define which functions are to be implemented upon the detection of the coordinates within various domains, for example the one marked "user-defined" on the mouse pad 100. This can be carried out by means of the software 210.

As shown above, the user can carry out a number of functions in a convenient way by means of just one input unit which reads coordinates on a mouse pad.

Of course other functions besides the above-mentioned scanner function and mouse function can be integrated into the input unit in order to further increase its usability. For example, it can have a function which makes it possible to record handwritten text. For this purpose a second position-coding pattern can be used, which codes coordinates for points within a different coordinate area to the one which is used on the mouse pad.

Other commands can be created in addition to those described above.

The above example is just one example of how the arrangement according to the invention can be designed. Based on the summary of the invention, a person skilled in the art can achieve a number of variants of this example.

For example, the input unit arrangement does not need to have both an input function and a mouse function. It can have just a mouse function, reading coordinates on the mouse pad being used in the same way as above but, of course, without any change to input function.

All functions do not need to be controlled by reading coordinates. Instead certain functions can be controlled using buttons on the input unit.

In the example above the signal-processing means are partially arranged in the input unit 300, and partially in the computer 200. This division can be changed and

more or less of the processing can be carried out in the input unit. In the extreme case it could be possible for the signal-processing means to be completely integrated with the image-recording means in one and the same casing.

The input unit arrangement can communicate with any other type of computer-based device, for example a PDA or a mobile telephone.

What we claim and desire to secure by Letters Patent is:

1. An input unit arrangement with a mouse function and an input function, comprising image-recording means for recording images and signal-processing means for processing the images to achieve the mouse function and the input function, characterized in that the input unit arrangement is arranged to change from the input function to the mouse function when the signal-processing means detect a predetermined position-coding pattern in one of said images.

2. An input unit arrangement according to claim 1, wherein the input unit arrangement is arranged to change from the mouse function to the input function when it detects a different pattern to the predetermined position-coding pattern in one of said images.

3. An input unit arrangement according to claim 1 or 2, wherein the predetermined position-coding pattern is a first absolute position-coding pattern which codes a plurality of positions, and wherein the input unit arrangement is arranged to carry out the change from the input function to the mouse function when the signal-processing means detect one of said plurality of positions on the basis of the predetermined position-coding pattern.

4. An input unit arrangement according to claim 3, wherein the first absolute position-coding pattern is part of a larger virtual absolute position-coding pattern

(continued)

(continued claim 4)

which comprises a second absolute position-coding pattern, and wherein the input unit arrangement is arranged to change from the mouse function to the input function when it detects a position which is coded by the second absolute position-coding pattern.

5. An input unit arrangement according to claim 3 or 4, wherein the first absolute position-coding pattern is divided into at least two domains and wherein the input unit arrangement is arranged to carry out different functions depending upon which of said at least two domains the signal-processing means detect.

6. An input unit arrangement with a mouse function comprising image-recording means for recording images and signal-processing means for processing the images to achieve the mouse function, characterized in that the signal-processing means are arranged to detect an absolute position-coding pattern in one of said images, to determine a position based on the absolute position-coding pattern and to detect to which of at least two domains the position belongs, the input unit arrangement being arranged to carry out different functions depending upon which domain the signal-processing means detect.

7. An input unit arrangement according to claim 5 or 6, which is arranged to generate a command for controlling an external computer when it detects a first of said at least two domains.

8. An input unit arrangement according to claim 7, wherein said command is a command for opening a program in the computer.

9. An input unit arrangement according to any one of claims 5-8, which is arranged to work in a relative mode when the signal-processing means detect a domain dedicated to relative mode and in absolute mode when the signal-processing means detect a domain dedicated to absolute mode.

10. An input unit arrangement according to any one of claims 5-9, which is arranged to work in a scrolling mode when the signal-processing means detect a domain dedicated to scrolling mode.

11. An input unit arrangement according to any one of claims 1-5, wherein the input function is a scanner function or a text input function.

12. A mouse pad which is provided with a position-coding pattern, characterized in that the position-coding pattern on the mouse pad is divided into at least two domains which are intended to achieve different functions of a mouse.

13. A mouse pad according to claim 12, wherein each of said at least two domains is provided with a visual indication which makes it possible for a user to understand which function of the mouse is achieved by means of this domain.

14. A mouse pad according to claim 12 or 13, wherein at least one domain is intended for the generation of a command for controlling a computer.

15. A mouse pad according to claim 13, wherein the command concerns opening a program on the computer.

16. A mouse pad according to any one of claims 12-15, wherein said at least two domains comprise a domain which is dedicated to achieve an absolute mouse function of the mouse.

17. A mouse pad according to any one of claims 12-16, wherein said at least two domains comprise a domain which is dedicated to achieve a scrolling function of the mouse.

18. Use of an absolute position-coding pattern in order to cause an input unit arrangement which has a mouse function to change from a first to a second function.



## Abstract of the Disclosure

A mouse pad is provided with a position-coding pattern which codes coordinates for a plurality of positions on the mouse pad. Different areas of the mouse pad are dedicated to different functions. An input unit arrangement can read the position-coding pattern. By placing the input unit arrangement in different places on the mouse pad, a user can cause the input unit arrangement to carry out different functions, such as changing automatically from the mouse function to an input function.

